

## WHAT IS CLAIMED IS:

## 1. A laser diode comprising:

5        a first contact layer comprising a first semiconducting material of a first carrier type, said first semiconducting material having a first index of refraction, said first contact layer having a trench therein, said trench having a bottom surface and side walls, said trench having a layer of a second semiconducting material of said first carrier type on the bottom thereof, said second semiconducting material having a second index of refraction, said second index  
10        of refraction being at least one percent greater than said first index of refraction;

      a first dielectric layer covering said first layer in those regions outside of said trench;

15        a first cladding layer comprising a third semiconducting material of said first carrier type, said first cladding layer overlying said dielectric layer;

      an active layer for generating light by recombination of holes and electrons, said active layer overlying said first cladding layer;

20        a second cladding layer comprising a fourth semiconducting material of the opposite carrier type from said first carrier type, said second cladding layer overlaying said active layer;

25        a second contact layer of a fifth semiconducting material of said opposite carrier type from said first carrier type, said second contact layer overlaying said second cladding layer;

      a first electrode connected electrically to said first contact layer; and

      a second electrode connected electrically to said second contact layer.

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      2. The laser diode of Claim 1 wherein said first, second, third, and fourth semiconducting materials comprise a group III element and nitrogen.

3. The laser diode of Claim 1 wherein said group III element is Ga.

4. The laser diode of Claim 1 wherein said bottom surface of said trench and one of  
5 said walls of said trench are covered with a layer of a coating material on which said second  
semiconducting material will not nucleate.

5. The laser diode of Claim 4 wherein said coating material is an electrical conductor.

6. The laser diode of Claim 5 wherein said coating material is titanium nitride.

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7. The laser diode of Claim 1 wherein said dielectric layer comprises a material on  
which said third semiconducting material will not nucleate.

15 8. The laser diode of Claim 1 wherein said active layer comprises a layer in said  
trench.

9. A method for fabricating a laser diode, said method comprising the steps of:

20 depositing a first contact layer comprising a first semiconducting material of a first  
carrier type, said first semiconducting material having a first index of refraction;

25 forming a trench in said first contact layer, said trench having a bottom surface and  
side walls;

coating said bottom and one of said side walls of said trench with a layer of a coating  
material on which a second semiconducting material will not nucleate, said second  
semiconducting material having a second index of refraction, said second index of refraction  
being at least one percent greater than said first index of refraction;

30 depositing a first dielectric layer covering said first layer in those regions outside of  
said trench;

growing a layer of said second semiconducting material in said trench by extending one of said walls of said trench that is not coated with said coating material;

5 depositing a first cladding layer comprising a third semiconducting material of said first carrier type, said first cladding layer overlying said dielectric layer and said layer of said second semiconducting material;

depositing an active layer for generating light by recombination of holes and electrons, said active layer overlying said first cladding layer;

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depositing a second cladding layer comprising a fourth semiconducting material of the opposite carrier type from said first carrier type, said second cladding layer overlaying said active layer; and

15 depositing a second contact layer of a fifth semiconducting material of said opposite carrier type from said first carrier type, said second contact layer overlaying said second cladding layer;

20 10. The method of Claim 9 wherein said coating material is an electrical conductor.

25 11. The method of Claim 10 wherein said coating material is titanium nitride.

12. The method of Claim 9 wherein said dielectric layer comprises a material on which said third semiconducting material will not nucleate.

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